Abstract Submitted
for the DPP19 Meeting of
The American Physical Society

ECE Imaging Cross Correlation for Coherent Fluctuation Measurement GUANYING YU, YILUN ZHU, University of California, Davis, XIAOLIANG LI, Institute of Plasma Physics, Chinese Academy of Science, JO-HAN YU, University of California, Davis, AHMED DIALLO, GERRIT KRAMER, Princeton Plasma Physics Lab, NEVILLE LUHMANN, University of California, Davis — The DIII-D ECE imaging (ECE-I) system is applied to measure radial mode structures and growth rates of coherent fluctuations whereby the noise is suppressed using correlation techniques between the 160 channels of the ECE-I system. These channels are arranged in a rectangle around the low-field side mid-plane. Because the spacing between neighboring channels along the flux co-ordinate is well outside the spatial coherence length for ECE radiation, radial correlation techniques were used to suppress the thermal noise and enhance the coherent modes. The ECE-I system can give the radial location of these modes even if they are highly localized near the edge. The radial resolution of our technique is limited by the natural line width of the ECE resonance, optical thickness effects at the plasma edge, and finite receiver bandwidths. For typical modes in the optically thick region of the plasma edge, we have achieved a radial resolution of 15 mm, which is supported by synthetic ECE-I simulation. In a proof-of-principle demonstration, we have applied our technique on sawtooth pre- and post-cursors and on Alfven eigenmodes to determine the spatial location and growth rates for those modes. The same technique is also applied to mode activity that is localized near the edge.

Guanying Yu
University of California, Davis

Date submitted: 03 Jul 2019 Electronic form version 1.4